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Nuts and Washers.—G. A. Walker, 583.

Oiling or Lubricating, &c.—E. B. Petrie and W. A Entwistle, 530. H. J. Haddan (com.), 671. W. Cunningham, 779.

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Ornamenting, &c.—E. Raths, 857. E. Edwards (com.), 939. A. M. Clark (com.), 941.

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Paper Pasteboard, Papier Mache, Paper Hangings.—C. A. Drake, 449. W. H. Beck (com.), 585. A. M. Clark (com.), 665.

Paperhanging, &c.—A. M. Clark (com.), 941.

Paste.—J. C. Mewburn (com.), 640.

Patterns, Designs, &c.—A. M. Clark (com.), 941.

Pencils, &c.—J. Hickisson and H. W. Langbeck, 752.

Pens, Penholders, Pencils, Pencil Cases, &c.—T. Nordenfelt (com.), 422. H. Hewitt, 429. J. J. Ridge, 626. L. H. Bertram, 702.

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Phosphorus, &c.—A. Adair and W. Thomlinson, 747. T. Twynam, 897.

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Picks, &c.—R. Walton and F. A. Stansfield, 573.

Pipes, Tubes, and Syphons: Joining Pipes.—G, Smith, 360. W. S. Turner, 437. G. Lohf, 474. T. B. Sharp, 491. H. J. Haddan (com.), 492. M. Benson (com.), 531. J. G. Stidder, 684. J. T. Foot, 713. J. P. Bark, 786. T. Drake, 840. H. Tugby, C. A. Day (com.), 922.

Pistons, &c.—A. McLaine, 408. W. Rowan, 649.

Preserving Food, &c.—T. Marshall (com.), 417. E. A. Brydges (com.), 426. E. A. Brydges (com.), 469. H. J. Allison (com.), 522. F. A. Colley and J. Wingfield, 534. T. Dolby, 782. H. J. Haddan (com.), 884. C. A. Meinert and P. Jeserich, 915.

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Printing and Transferring: Type and other Surfaces for Printing, Composing, and Distributing Type.—W. R. Lake, 380. A. Coates, 413. E. J. Jones, 492. D. Appleton, 543. W. H. Beck, (com.), 585. H. Luetke, 647. W. W. Colley, 689. E. Raths, 857. J. R. Meike (com.), 896. C. Hindle and J. H. Canavan, 901. A. M. Clark (com.), 941.

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Propelling Ships, Propellers, Paddle-wheel, and Screws.—E. P. Alexander (com.), 506. J. Stewart, 579. R. M. Steele, 854.

Pumps, Pumping and Forcing Liquids, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—W. A. Miles, 368. J. Cross and C. I. J. Wells, 605. G. M. Capell, 911. J. Hall, 938

Punching, or Perforating, &c.—R. H. Tweddell, J. Platt and J. Fielding, 597.

Rags, &c.—B. J. B. Mills (com.), 869.

Railways, Carriages, Coupling, Uncoupling, and Altering Positions of Carriage and Engines.—S. A. Croft and R. Lomax, 351. J. Cleminson, 370. P. Jensen (com.), 395. A. M. Clark (com.), 402. W. Stableford, 459. M. R. Ward, 539. W. E. Gedge (com.), 636. T. R. Hutton and R. A. Gartside, 746. T. F. Craven, 819. W. R. Lake (com.), 822.

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables, &c. P. Jensen (com.), 395. A. M. Clark (com.), 402. W. Hopkins and C. Turner, 418. G. J. Chapman, 450. E. N. M. Hepworth, 604. J. Lindley, 700, T. G. M. Stoney and R. C. Rapier, 710. T. Matthews and W. Bayliss, 815. P. M. Justice (com.), 935.

Rakes &c.—W. R. Lake (com.), 728.

Reaping and Mowing, &c.—J. Howard and E. T. Bousfield, 462. B. Samuelson and W. G. Mainwaring, 424. H. and G. Armour, 809.

Reflectors, &c.—H. H. Lake (com.), 467.

Refrigerating and Freezing, Cooling Liquids, Making Ices, &c.—M. Mutter, 736.

Registering, &c.—W. P. Thompson (com.), 454. S. Gray, 464. A. Budenberg (com.), 601. W. F. Stanley, 627. J. Whiteley, 827. B. W. Webb, 850. H. Smith, 855. W. Taylor, 856.

Retorts.—H. E. Newton (com.), 646.

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Samples, Specimens, &c.—F. McIlvonna, 525.

Salt, &c.—W. D. Herman, 376.

Saws, &c.—P. Gay, 578. W. Wallace, 630. J. H. Johnson (com.), 753.

Scrapers, &c.—W. S. Turner, 437.

Ships and Boats, &c.—H. H. Lake (com.), 358. W. R. Lake (com.), 575. S. Hermann, 669. L. W. Broadwell. 768. T. F. Craven, 819. R. M. Steele, 864. J. Hamilton and R. McIntyre, 879. J. Tweedy, 898.

Ships' Rigging, Sails, &c.—A. E. Maudsley, 873.

Showcases, &c.—F. McIlvenna, 525.

Sifting, Sorting, and Separating, &c.—M. Lyon (com.), 390. W. P. Thompson (com.), W. R. Lake (com.), 704. H. H. Lake (com.), 777.

Signals, &c.—W. Robertson and E. D. Holtham, 354. E. F. R. Boehm (com.), 355. J. H. Cureton, 421. A. M. Clark (com.), 439. R. W. Vining, 526. W. Darby, 603. H. Marlow, 666. G. Porter, 772.

Signs, &c.—H. B. Palmer, 373.

Sinks, &c.—S. S. Hellyer, 599.

Size, Glue, &c.—G. Eaton, 346.

Slabs, &c.—J. C. Bloomfield and J. McGurn,

Slag, or Scoria, &c.—T. Twynam, 897.

Soap, &c.—W. R. Lake (com.) 513.

Sockets, &c.—T. Brown, 1029.

Spinning and Preparing for Spinning.—H. Southwell and W. H. Dawson, 363. H. J. Haddan (com.), 367. J. M. Hetherington, 471. J. Tatham, 503. J. T. Nelson, 653. R. Fairbank and J. Robertshaw, 691.

Tea, &c.—G. L. Cumberland, 356.

Telegraphs; Telegraph Printing Apparatus.—C. A. Teske, 349. T J. Handford, 460. G. H. Bassano, A. E. Slater and F. T. Hollins, 594. H. Marlow, 666.

Testing Strength, &c.—J. Whiteley, 827.

Thermometers, Barometers, Lactometers, &c.—W. P. Thompson (com.), 454.

Thrashing Machines, Reaping Machines.—R. and F. Garrett and J. D. Ellis, 607.

Tramways, &c.—F. A. Abeleven. 407. E. G. Chapman, 450. H. Scott. 745.

Turning, Lathes, &c.—F. Wirth (com.), 398. J. W. Hall, 412.

Umbrellas.—M. Hyam, 609.

Upholstery, &c.—T. Webster, 615. G. Lowry, 658. W. R. Lake (com.), 947.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. H. Johnson (com.), 425. E. P. Alexander (com.) 506. T. English, 556. J. H. Johnson (com.), 562. W. Ainsworth, 644. H. C. Symons, 651. T. C. Fawcett and J. C. Hargreaves, 654. H. H. Lake (com.), 890.

Walls.—C. Weygang, 427. W. White, 637. F. Livet, 726. W. Mullett, 803.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—J. Kennedy, 759.

Water-Closets, &c.—F. J. Austin, 544. H. S. Symons, 651.

⁂ The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.

The Voltaic Arc.—At a recent meeting of the London Physical Society, Prof. S. P. Thompson read some "Historical Notes on Physics," in which he showed that the voltaic arc between carbon points was produced by a Mr. Etienne Gasper Robertson (whose name indicates a Scotch origin), at Paris, in 1802. This reference is found in the *Journal de Paris* for that year. Laboratory notebooks at the Royal Institution, however, are said to show that Davy experimented with the arc quite as early. The experiment usually attributed to Franklin, of exhausting air from a vessel of water "off the boil," and causing it to boil afresh, is found in Boyle's "new experiments touching the spring of the air."

A *railroad switch* has been patented by Mr. Charles F. A. Eddy, of Greenfield, Mass. The invention consists of a latch and spring contrivance with the switch bar and switch rail, whereby the spring will set the switch for main line automatically when detached from the latch of the switch bar; and also of devices by which the latch may be detached by the flange of the pilot wheel of the locomotive, to enable it to be set for main line by the spring in advance of the wheels, when the locomotive is running along the main line from rear of the switch. It also consists of a contrivance whereby the attachment on the locomotive will unlatch the switch, either way the locomotive may go, at the will of the engineer, thus ensuring safety to the train.

Reviews.

"Chemical Percentage Tables and Laboratory Calculation." By A. H. Ridsdale. London, Crosby, Lockwood and Co.

The title of this work tells its own tale, and all we need add is that, as far as a critic can judge of such a work without a course of practical use, it is commendable as to intention and execution.

"How to Marry and Live Well on a Shilling a Day." By William Couchman. Second edition. London, F. Pitman, Paternoster Row; and Temperance League Office, 337, Strand. Manchester, 56, Peter Street.

The title of this penny pamphlet has doubtless been read by some who considered it a catch-penny attempt upon their credulity; whilst others well acquainted with the tactics of the teetotal despot section of society have been inclined to read it because the tyranny that they wish to fasten on the necks of their fellow-men may possibly receive much support.

We have seldom enough patience to deal with the desperate attempts to shelve the action of common sense, and render life a drawling, tasteless, disgusting existence which the uprooters of all human views and habits wish to enforce upon mankind. However, the present pamphlet being pushed before us we are for the nonce led to deal with it; the more so as all puritanist publicists tell the world something which is well worthy of consideration, when their exaggerated anti common-sense idealities are taken *cum grano salis*, as it is termed. The present work is devoted to the advocacy of vegetarian diet, and we assume total abstinence from alcoholic drink.

It presents as evidence in its favour the large number of people, that is our working-classes generally, who are assumed to thrive well upon *spare diet*, mostly *by compulsion*,—vegetable (especially the agricultural people, who are made to serve as evidence in favour of the vegetarian scheme),—the overmastering factor of life and work in salubrious country fields being utterly forgotten as making *all the difference in the world*, in the comparison of poorly-fed people in the country with poorly-fed people in the towns,—independently of the fact that the slow-coach work of the countryman is something quite different to the work of the townsman of the present day.

One great difficulty in working out vegetarianism for the people is *cookery*, for it requires daily care and the use of fire, plenty of clean utensils, and attention to many domestic matters, which the working-classes and poor people, from the pressure of daily work, and poverty, find almost insuperable barriers to such a system, unless kept to its ultimate prison fare of bread and water. Again, if all the world is to live on vegetable diet how is the supply of food to be obtained?

Every bit of land in this country (especially keeping vicissitudes of season in view) or in any country, cannot be depended on for certainty of returns of vegetable products. In truth that which God hath not prohibited should be free to every man.

Let all these extremists set to work to carry out abstinence from flesh meat and from drink *as far as is reasonably practicable* and they will do good. But their absolute prohibition deserves the opposition of the upholders of human freedom to the bitter end. If Mr. Couchman's work leads well-to-do people to consider his views in their dieting it will be well, but in its rigour we object to his views.

Sewing machines, patented by Mr. Luther E. Higby, of Brattleborough, Vt., consist of improved combinations of parts, for an adequate explanation of which engravings would be necessary.

ON THE MEASUREMENT OF ELECTRICITY FOR COMMERCIAL PURPOSES.

By JAMES N. SHOOLBRED, B.A.,
Mem. Inst. C.E. and Soc. Tel. Engrs.

THE following is an abstract of a paper read before the Society of Telegraph Engineers and of Electricians, on February 22nd, 1883.

The basis of the production of the electric current from dynamo-machines (to which method of production the paper is confined) is the conversion of mechanical into electrical energy. It becomes necessary, therefore, to ascertain the amount of each kind of energy in order to regulate the commercial conditions upon which an electrical supply, such as is contemplated by the Electric Lighting Act, 1882, can be undertaken. It is, however, only with the electrical part of the question that the paper deals.

In any series of measurements, a precise knowledge of the units upon which they are based is absolutely essential. The electrical units, as decided upon by the International Congress of Electricians in Paris in 1881 are, therefore, described. The words of Sir Wm. Thompson to the Congress, when explaining the relation of the units to each other, are: "The 'Volt' acting through an 'Ohm' givs a current of one 'Ampère,' that is to say, one 'Coulomb' per second; and the 'Farad' is the capacity of a condenser which holds one Coulomb when the difference of potential between its two plates is one 'Volt.'"

For the measurement of the electrical energy of a supply, it is necessary to ascertain the pressure or electromotive force (in Volts), and the rate of the current produced (in Ampères). If the time during which the current is supplied is also taken into consideration the quantity (in Coulombs) is obtained. In the former case the energy, or power, of the supply is represented by the product of the pressure (in Volts) by the rate of the current (in Ampères); while in the latter case, the actual amount of work done depends upon the product of the duration of the supply (that is upon the quantity, in Coulombs) by the pressure (in Volts).

The principal instruments intended for electrical measurements are, therefore, devoted to ascertaining the conditions of either pressure, current, quantity, energy, or work, respectively. They are known generally as Volt, Ampère, Coulomb, power, and energy, metres or measures.

They may be either registering instruments, or not; according as a continued record is intended, or not, to be kept. Quantity or Coulomb Metres, and also Work or Energy Metres, must be recording instruments; since time is a necessary element in their calculation. A number of non-recording instruments are described, such as—Siemens' Electro Dynamometer, and Torsion Galvanometer, Sir Wm. Thompson's Current, and Potential Galvanometers, Deprez's Galvanometer, Ayrton and Perry's, Am, Volt, Ohm, and Power Meters.

The Registering instruments, which alone comply with the ordinary acceptation of the term "meter," are divided into two classes —1° Quantity or Coulomb Meters, and 2° Energy or Work Meters.

In the first-named class some, such as Edison's and Sprague's, are based upon electrolytic action; that is upon the deposition of metal, such as zinc or copper, by a portion of the current. As this part bears a known proportion to the entire current, the total quantity supplied can readily be gathered from a knowledge of the amount of metal deposited by the fractional current. In Sprague's Meter there are also certain mechanical arrangements for reversing the direction of the current, and for recording the number of such reversals. The remainder of the Coulomb Meters, such as Hopkinson, Boys, Ayrton and Perry, &c., are purely mechanical arrangements for indicating a series of effects, due to the intensity of the supply, and continued during a certain length of time. The various modes of effecting these operations and records are shown upon index dials, like in gas and water meters.

In the class of Energy Meters, those represented by Boys, and by Deprez, also record upon index dials, by different methods, the accumulated actions due to the current. While Ayrton and Perry's Erg. Meter is an ordinary clock, the pendulum bob of which is replaced by a coil. The action of the electric current in this, and in another coil, causes retardation or acceleration (as may be desired) in the normal rate of the clock; and the total amount of this error is a measure of the energy of the supply during that time.

The paper likewise discusses the unit of price, suggested in some of the Provisional Orders, now before the Board of Trade: the unit there suggested is the "Volt-Ampère-hour" unit. This unit essentially takes note of the pressure or electro-motive force; and should this latter be fixed at different rates in different localitities, the graduation of the meters would also vary in each place. Whereas by adopting the "Coulomb" (*i.e.*, the "Ampère hour" translated into quantity) as the unit, the registration of the meters might be uniform, irrespective of locality, since any difference in the degree of the "standard pressure" required would be allowed for by a variation of price. For the ordinary consumer, the "Coulomb" Meter would be much simpler and more economical than would be the Energy Meter required for the "Ampère-hour" unit, which entails a clock or other time recorder.

HOW STEAM-ENGINE VALVES ARE FINISHED.

WE have extracted from the *Scientific American* the following matter of great interest.

Scraping for fits in the machine shop is quite modern. It is the present practice to make all rubbing fits, of whatever form, by scraping. Formerly fits were made by grinding the two moving surfaces together after planing, or turning, and filing. Emery and oil were used on iron, and sand and water on brass. There were two serious objections to this method. One was that the sharp particles of emery or sand would become imbedded in the metal and continue the grinding or cutting operation long after it should have ceased; and another was that by grinding the two surfaces together each imparted to the other its imperfections, the protuberance on one producing a corresponding depression on the other, thus perpetuating the evil the process was intended to remedy, if not to remove.

Of late years a finished fitter is expected to understand practically the work of scraping, and to know the use of the surface plate and straight edge. Steam valves especially are fitted in no other way than by scraping.

The usual method of making a fit by scraping is to coat the two surfaces which are ultimately to work together with red lead thinned with oil, and then rub them together. Wherever the bearing comes, there the paint is removed and the scraper should be applied. But there are objections to the use of this pigment, as gradually it fills the pores of the metal and reduces the entire surface to a dull reddish-grey colour not admitting of any shading. A better method and material is a quick wipe over with a rag saturated with spirits of turpentine. After rubbing, the salient points will show bright, while a dry film will remain in the hollows. The surface will always remain clean, and no change of colour will occur during the entire process of scraping.

It is obvious to the least consideration that the fitting of two rubbing surfaces at the usual heat of the atmosphere and their fit under a very much higher temperature may not be uniform, especially if the mass of one of the moving bodies is much greater than that of the other, as in a valve and a steam chest.

Here then was a puzzle; how to make a cold scraped fit be also a fit under steam temperature. When it is considered that 70° may be considered general shop temperature, and that 65 pounds pressure of steam is about 316° temperature, it is evident that here is room for apprehension that a scraped fit of steam valves under ordinary circumstances would not be a good fit under working circumstances. And so it has proved in experiments.

A test was carefully made on the main valves of a new engine. The valves were scraped to a *perfect* fit—perfect humanly speaking—and tested by air at the normal temperature. They were tight. Then steam was let on, and in a short time the valves leaked a perfect sheet of steam.

The main valves of steam-engines are now tested—and marked for scraping—by steam at full pressure. At least this is the practice at the Hartford (Conn.) Engineering Company's Works. A pipe is led from the boiler to the cylinder and steam chest of an engine "in progress;" the steam chest is temporarily covered in, the valves, valve rod, and necessary appurtenances in place. The valve rod is attached to an adjustable slotted arm, set to represent the transverse of the valve for that particular engine, the arm or crank being fixed to a shaft with belt and pulley driven by a counter-shaft. Steam is let on, the valve set in motion, and run for a few minutes. When the steam is shut off and the valves removed, it is found that the steam heat and the rubbing has shown the places of bearing as well as would the red lead or the turpentine cold, and two expert scrapers go at the faces of the valves while they are still hot. The final result is as near perfection as human skill can expect.

IMPROVEMENTS IN GLASS MAKING.

THE high expectations in regard to toughened glass can scarcely be said to have been realised as yet, and several improvements must still be made before the process can be considered as perfect.

The original method consisted in immersing the article while still red-hot in a bath of oil heated to 200° C. (392° F.), and letting it remain there until it had cooled down to that temperature. Glass hardened in this way was, indeed, hard enough, but at the same time it was very brittle, so that if put away and kept untouched it would frequently explode and fly in pieces without any visible cause.

T. Lubisch claims to have discovered a better method of hardening glass, or, rather, an improvement on the same process. He also immerses the article, while red-hot, into a hot bath, but he takes it out again when it has nearly lost its redness, and lets it cool *very* slowly in an oven that is heated nearly to the temperature of the glass.

As the bath does not need to be much above 212° F., he prefers to use solutions of the carbohydrates in water (starch, gum, or the like). Such a bath does not soil the surface of the glass, as is the case with fats, oils, and bituminous substances.

Glasses subjected to this operation resist pressure and shock just as well as those hardened in oil, but possess this advantage, that they can be cut with a diamond or polished and cut with sandstones.

While the oil method only permits of the hardening of articles of simple shape, by Lubisch's process all glass things can be hardened, as, for example, bottles, mugs with handles, pitchers, and other vessels.—*Industrie Zeitung*.

SOME RECENT INVENTIONS IN ELECTRICITY AND ELECTRIC LIGHT.

By T. Morgan.

In undertaking to give a glance at recent inventions I know I shall not at all do justice to the subject for this reason, that the number of Patents during the past year relating to electric light would require far more than can be expected in the cursory glance I intend to make, and I will therefore restrict myself to a few new inventions recently patented.

I may here state that with regard to the systems so well known, Brush, Edison, Swan, Siemens, and Compton, I do not touch upon, except by saying that the various Patents taken out recently by these well known inventors are for the most part improvements in details for the more economical working of each and every of their systems.

As in the case of Sir D. Salomons, who has some recent improvements in hand, he has written me that he is not able to give me information of his recent improvements as experiments are still going on. I have also received other letters from the inventors of more recent inventions who express the same view.

I will therefore proceed to submit to this meeting a few, and I think great, improvements recently made.

In the case of Arc lamps I do not think I could do better than begin with that of Mr. Cromwell F. Varley and Mr. F. H. Varley. The important points of this invention consist in a roller contact clutch which accommodates any diameter of carbon rod inserted. I may say that this is a very important feature, seeing that in a great many Arc lamps no such provision can be allowed for. Another peculiar feature of this invention is what is termed an insulated swing arm, fixed into a cap carrying a fixed opposite carbon pole, and to charge the lamp the swing arm is moved on one side. The carbon rod or candle is inserted through the roller contact clutch, and forced into a socket attached to the lower or remote end of a spiral spring or weight and thus forces back the spring or weight to the length of the carbon to be used. The roller clutch is provided with a magnetic regulator for determining the length of the arc. This they prefer to construct in the form of cylinders or rods of metal placed in a coil or coils, wound with two separate wires, one of which is in the main or arc circuit, and the other forms part of a derived circuit or shunt of the current flowing through the arc.

There is one peculiar feature in this invention which may be commended to electrical engineers, and that is, the carbons can be formed hollow so as to allow a jet of gas to pass through and surround the carbon rod.

Another and very important feature I think in this lamp is the means for regulating the advance of the carbons at their relative rate of consumption.

Somewhat resembling this arrangement of Messrs. Varley is a patent secured by Mr. Lea, of Birmingham, which has for its object the better regulation of the feed of the carbon or carbons, in order to insure a steady light; and at the same time to be able to employ carbons of greater length than heretofore. According to the invention, the upper carbon is held in position by rollers (by preference, three), two of which are held in a metal frame for their bearings, while the third is a riding or "jockey" roller, adjustable to any given pressure by means of a spring and adjusting screw. These rollers are so constructed as to allow of different sized carbons being placed between them. The feeding action for lowering the upper carbon, as consumed, is as follows:—An electro-magnet is employed and actuates a gripping lever for the purpose of revolving the rollers, and this electro-magnet is connected as a shunt from the main circuit. This shunt circuit is divided to allow of a variable resistance in order to increase or decrease the motion of the feeding lever. A second electro-magnet is employed to form the arc by separating the upper and lower carbons. A projecting arm is placed upon the frame of the jockey roller in such a position that, should the carbons be apart, the feeding electro-magnet acts upon and releases the jockey roller, and allows the carbons to come into contact. A short-circuiting arrangement is placed upon the frame of the jockey roller, so that when the upper carbon is consumed, a contact is made, and the lamp cut out, but allowing all the other lamps in the same circuit to continue burning.

In regard to the Incandescent lamps it is difficult to state or enumerate what has or has not been done recently, but to a great extent improvements have been restricted to the fittings and the strips or filaments of carbon enclosed in the globe. An essential feature of an incandescent lamp is that the globe must be in vacuo, or filled with a gas. To secure this result and obtain the best results many contrivances have been made. One recently patented by a Mr. Akister, consisting in fixing the wires in a peculiar form and manner by fusing them into the opposite ends of a transverse rod of glass, and also fusing said wires to the bulb by fusing same to the glass distinct from the operation of closing the neck, thus securing effectual vacuum.

Mr. H. Lea, of Birmingham, also has invented means and appliances for connecting and disconnecting incandescent lamps to and from the brackets or supports. This is a feature so far as regards incandescent lamps, and I will quote from his specification.

"My improvements consist in simplifying the holder and parts connected therewith so as to facilitate the removal and replacement of the lamp when required.

"In an incandescent electrical lamp made according to my invention, the hollow glass globe is surmounted by a hollow neck, the upper end of which has the form of a transverse T-shaped head at each extremity of which one of the aforesaid conducting wires is brought out and bent into a small loop which is folded down and pressed closely against the glass. The holder consists of any suitable nonconducting material, two metallic springs, and two binding screws. The tails of the spring are bent into such a form, and placed at such a distance apart, as to grip and hold securely the head of the globe when forced up between them and at the same time to form metallic contact between each spring and the platinum wire upon which it presses. The springs are attached to each side of the holder near its upper end, each spring being suitably folded into notches formed in the holder, and being held in position by a binding screw screwing into the substance of the. The lower portion or tail of each spring occupies a vertical groove in the side of the holder, and a transverse groove in the bottom of the holder unites the two vertical side grooves.

"The width of the transverse groove is no greater than will admit the shorter axis of the T-shaped head of the lamp globe, and when the lamp is pushed upwards from below its head is forced between the tails of the springs, the lamp being thus suspended and electrical contact simultaneously made. The holder is attached to a bracket or pendant by screwing or otherwise.

"The oblate form of the T-shaped head prevents the possibility of inserting it into the holder in a wrong direction, and also prevents the possibility of turning the globe and the platinum loops out of contact with the springs when once the globe is in position."

Referring to carbon strips or films as used in incandescent lamps, we have heard of the elaborate series of experiments made by Mr. Edison. We have, according to a recent inventor, another peculiar substance which may serve the purpose equally well, viz., the cocoa-nut shell. This is cut out in strips, which are then laid flat on wood and fixed with glue. A process of drying is employed, and the strips are bent to required shape by immersion in oil at suitable temperature.

As regards Secondary Batteries a Patent has been recently secured by a Mr. Muirhead in which he proposes the formation of metallic electrodes for secondary batteries by placing them in a vat through which a solution containing lead is caused to flow, producing deposit on the plates from the stream.

Whether this plan will commend itself to electricians I know not, but if the plates before-named will be applicable I think we will have what is required.

Mr. St. George Lane-Fox has also recently secured an invention which consists of an improved construction and arrangement of the lead plates in Plante's secondary batteries, so as to give an increased storage capacity, and for this purpose he takes a number of strips of lead or lead-foil and superposes them or places them side by side with alternate layers of sand, asbestos paper, or other suitable porous material, and then presses them together so as to form a thick plate, which will thus be composed of laminae of sheet-lead or lead-foil and a porous separating substance. He connects together all the laminae forming this plate of lead or solder at the side or sides, or top or bottom. Two or more of these laminated plates are mounted in a vessel of glass or other suitable material containing dilute sulphuric acid, in such manner that the edges of the laminæ of one plate or set of plates which form one pole or cell are opposed to, but do not touch the edges of the laminæ of the plate or plates, which form the other pole or cell. As the whole surface of every laminæ is an active surface the storage capacity of all the laminæ, that is to say, of the battery, is enormous.

Referring to the distribution of electric current, there is one system that has come under my notice, and that is the system of Gaulard and Gibbs. This system is now being shown at the Exhibition at the Royal Aquarium, and full particulars will be given in the *Review*.

A novel device for holding coins of various denominations has been patented by Mr. George W. Rowley, of Caledonia, Wis. The invention consists in a coin holder formed with a plate having recesses for receiving and means for securing the coins therein, a flanged cover hinged to the same, connected with which are spring strips having their ends provided with tongues for holding the coins in place. Joined to the lower end of the plate or cover is a pouch or bag for receiving bills or foreign coins.

The Digestibility of Oysters.—Why oysters should be eaten raw is explained by Dr. William Roberts in his lecture on "Digestion." He says that the general practice of eating the oyster raw is evidence that the popular judgment upon matters of diet is usually trustworthy. The fawn-coloured mass, which is the delicious portion of the fish, is its liver, and is simply a mass of glycogen. Associated with the glycogen, but withheld from actual contact with it during life, is its appropriate digestive ferment—the hepatic diastase. The mere crushing of the oyster between the teeth brings these two bodies together, and the glycogen is at once digested without any other help than the diastase. The raw, or merely warmed, oyster is self-digestive. But the advantage of this provision is wholly lost by cooking; for the heat immediately destroys the associated ferment, and a cooked oyster has to be digested, like any other food, by the eater's own digestive powers.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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SESSION 1882—1883.

March 8th.
March 22nd. Executive and General Council Meeting.

The dates of these meetings may, by notice by circular, be altered in accordance with the Parliamentary progress of Patent Reform.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

At the meetings on February 8th and 22nd, presided over by F. H. Varley, Esq., Chairman of Executive Council, on motions by J. P. Cutts, Esq., seconded by J. Greenfield, Esq., and by T. Morgan, Esq., seconded by J. Kenny, Esq., arrangements were made as to the promised Government, No. 1, and other Patent Bills. No answer has been received from the President of the Board of Trade, and the Government Bill is not yet issued, but all are in progress—No. 2 Bill, by the Society of Arts, and No. 3 Bill, backed by Messrs. Anderson, Broadhurst, and other M.P.'s, as the following extract from the *Times*, 27th ult., exemplifies :—

PATENT LAW REFORM.

Report of Proceedings in the House of Commons.

SIR J. LUBBOCK, in moving the second reading of the Bill, said that it was the same as that which he had had the honour of introducing last year, and to the second reading of which the House last year agreed without a division. He hoped they would adopt the same course on the present occasion, and that it might be then referred to the same committee as the Bill introduced by the Government. He believed the present Bill was a good one, and felt he might say so, as the merit was not his, but belonged to the Society of Arts, and especially to Sir Frederick Bramwell. He introduced it on behalf of the Society of Arts, and in their name he asked the House to assent to the second reading. It was a comprehensive measure, and he knew that on some of the clauses there would be discussion, but he thought they could be better considered in committee.

MR. CHAMBERLAIN said that he should not oppose the motion of the hon. baronet. At the same time he did not think that it was altogether satisfactory to agree to the second reading of a Bill without discussion. The views of the framers of the present Bill and of the Bill introduced by the hon. member for Glasgow might have been fitly expressed in the form of amendments to the Government Bill on the same subject.

The Bill was then read a second time, as was also the Patents for Inventions (No. 3) Bill, on the motion of Mr. ANDERSON.

Monthly Notices.

Exhibition of Meteorological Instruments.—The Council of the Meteorological Society have determined upon holding at the Institute of Civil Engineers, on the evening of March 21st, an exhibition of meteorological instruments which have been designed for, or used by, travellers and explorers.

Journalism in Turkey.—Journalism in Turkey is not without its distinctions. The *Osmanli* announces the death, at the age of seventy-eight, of his Highness Ahmed Moukhtar Bey, commonly known as Mollah Bey. His father had been twice Grand Vizier, and he was brought up to the profession of the law. He was for twelve years editor of the official journal the *Takvim-i-Vakai*, and was the author of several works on jurisprudence and commentaries on Mussulman authors. He twice held the high dignity of Sheikh-ul-Islam. His death still leaves in Turkey journalists who hold the title of Highness.

"Daniel Deronda" is being published in French in the *Moniteur Egyptien* at Cairo as a *feuilleton.*

Death of Mr. J. Harvey.—Mr. J. Harvey, whose death is announced in the daily papers, may claim notice in a literary journal as having, besides writing in other journals, contributed many articles in defence of Christianity to the *Reasoner*, the Secularist journal edited by Mr. Holyoake. Mr. Harvey was a moderate and fair controversialist.

The Manufacture of Steel.—It appears from statistics recently in *La Houille*, that Great Britain has, at present, 23 metallurgical works producing steel, with 115 converters, and a productive capacity of 1,460,000 tons per annum ; Belgium has four steel works, with 18 converters, and a productive capacity of 380,000 tons ; Austria 14 works, 36 converters, 632,000 tons ; Germany, 23 works, 80 converters, 1,300,000 tons ; Russia, five works, 10 converters, 100,000 tons ; Sweden, 35 converters, 80,000 tons ; the United States, 34 converters, 1,500,000 tons. This applies to Bessemer Steel. As regards the Thomas Gilchrist method, there was produced by it, in October last, in Germany, 25,170 tons of steel, from eight firms ; in England, the works of Bolckow, Vaughan, and Co., the only one using this process, produced 2500 tons ; Belgium produced 1687 tons ; Russia, 1270 tons ; France, 1240 tons (the last three have each, like England, only one steel works using the process). This gives a total, for October, of 46,537 tons of basic steel produced in 15 works.

Carbamide as a Substitute for Quinine.—The *Journal d'Hygiène* learns from Gen. Kokhowski that Dr. Belvousoff has discovered an efficient successor for quinine. Belvousoff, Prosector at the University of Kharkoff, presented his memoir before the Russian Commission of Hygiene on the 5th of October last, recommending carbamide as the substitute for quinine. From experiments made in the hospitals, the following results were obtained :—1. That in cases of intermittent fever carbamide acts as a specific. 2. That this remedy can be employed in many other complaints to reduce the temperature of the patient ; it is, moreover, without taste, and does not depress the nervous system.

Effects of Diet on Liability to Infection.—Professor Feser, of Munich, has been making experiments on animals with a view to establishing the connection which exists between diet and liability to infection. In the trials he has made on rats inoculated with the poison of cattle distemper, he demonstrated the fact, says the *Lancet*, that the animals which had been fed on vegetable diet were quickly attacked by the disease, while those which had been fed exclusively on meat resisted the effects of inoculation. In recording this fact, a leading journal, in connection with the Continental leather trade, attributes to the greater amount of vegetable diet, in the shape of bread, beer, &c., taken by woolsorters between Saturday and Monday, the greater frequency of cases of outbreak and the aggravation of disease during that period.

Examination of Petroleum.—M. J. Schenkel says :—A petroleum which gives off more than 5 per cent of volume below 140°, and more than 10 per cent below 300°, is to be rejected. The commercial value of petroleum is determined by the volume percentage which distil over between 145° and 300°. The petroleum which distils over between these two limits is considered as normal petroleum.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
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MARCH, 1883.

WEATHER FORECASTS AND STORM SIGNALS.

WET and windy weather and night white frosts have been so well supplied tous this winter as to give additional interest to a paper recently read by the Honourable R. ABERCROMBY before the Meteorological Society, on "Some of the Types of British Weather."

It may be stated briefly (as Mr. Abercromby does) that (1) when the barometer is for several days highest to the eastward and lowest to the westward of our islands, the prevalent winds are southerly, the weather damp, and in winter warm; the depressions which appear off our western coasts usually move in a northerly or north-easterly direction outside our western coasts, while the subsidiary disturbances take a course more inland, and at times cause the rainy weather to extend even to our eastern and south-eastern counties. (2.) When, however, pressure is highest to the southward and lowest to the northward of our islands, the prevalent winds are westerly, the rainfall less abundant (except in the extreme north west and north), temperature is less high, and the air drier; clear skies are of more frequent occurrence, and while the main depressions move from west to east over the extreme northern districts their subsidiaries travel in a similar direction, but pass more or less over our islands, and occasionally cause showery weather to spread temporarily to our southern counties. (3.) When pressure is highest over the Atlantic (to the westward of Ireland) and lowest over Northern Europe and the Baltic, the weather is decidedly colder than during the prevalence of either of the types already mentioned; the winds vary from between west and north, the rainfall is even less abundant than with the westerly type, and prevails more over our northern and eastern than it does over the western districts. The main depressions which appear in our neighbourhood travel usually in a south-easterly direction, their centres passing over Scandinavia to the Baltic, while their subsidiaries cross over our northern districts and the North Sea, and in winter-time often give us sleet or snow-showers over the greater part of the country. (4.) With pressure highest to the northward and lowest to the southward of us the wind is easterly and north-easterly, strongest on our eastern and southern coasts, lightest in the north. Temperature is low, cloud prevails chiefly over the more southern regions, with rain, soft hail, or snow over the eastern and south-eastern districts. The depressions which appear under these conditions vary greatly in their movements. Those which arrive off our south-west coasts occasionally travel to the south-eastward and pass over France towards Switzerland; some hang about the mouth of the Channel and gradually disperse; while others, usually of a shallow and subsidiary character, are formed over North Germany and advance westward to our south-eastern stations.

The masterly article in the *Times* of February 2nd, 1883, from which we quote, shows that these changes take place during the simpler forms of pressure distribution—*i. e.*, when the barometer stands high over one portion of our area and low in the opposite part. While these conditions prevail forecasting is comparatively simple (although it occasionally happens that the subsidiary disturbances advance with a rapidity which is almost startling, and thus upset every anticipation which can be made even twelve hours in advance). In the intervals between the various depressions the anti-cyclonic conditions of dry, bright weather are fully developed. We have very often to deal with times when the European high-pressure area lies largely over Scandinavia and Northern Europe, while the Atlantic area lies partially over Spain snd the south-west of France. At times each of these extends an arm—one to the south-westward and the other to the north-eastward, and these nearly meet and form a kind of "coll" either over our islands, the North Sea, or some other district in our neighbourhood. It is under these circumstances that the changes caused by the arrival of depressions in our neighbourhood are extremely fickle and irregular. Should the "coll" lie immediately over our islands and the depressions arrive off our western coasts, they will on some occasions run straight to the northward or north-eastward on the Atlantic side of the anti-cyclone, and affect only our western districts by their southerly winds and rain. At other times they will hang off our western coasts for a time, and either throw off subsidiary disturbances in an easterly direction so as to form a "trough," or band of low pressure, or themselves pass through between the two anti-cyclones, and then, moving with great rapidity after the "coll" has been passed, disperse to the eastward of the North Sea. In deciding which of these movements is most likely to take place, the instrumental readings over our islands as at present understood seem to give but little aid: it is probable, however, that much light will be thrown on the subject when the movements of the upper currents, as shown by the drift of clouds of the *cirrus* type, have received more close and continued attention than they did during the earlier stages of meteorological work.

Then, again, there are times when these two great high-pressure areas, though lying in such positions with regard to each other as to bring about a mingling of the easterly and westerly currents of air, are nevertheless separated by an extensive and shallow area of low pressure. When these conditions prevail (as they have frequently done during recent summers) it will be observed that, while there is an absence of large well-formed depressions travelling over the country in definite directions, small shallow disturbances are constantly being formed over us, which move for short distances in irregular directions and then disperse. These often bring with them thunderstorms and heavy local rains; they give no definite indication by the barometer as to the precise region in which they are likely to appear, and but very little of the direction in which they will move. Their existence is often terminated in a few hours, and, from the fact that very few (if any) of them advance towards our islands from the westward, they present difficulties to forecasting for a day in advance which it is almost impossible to deal with at present; but, in carrying out the work of classification, it would appear evident that, as the movements of the ordinary depressions are in most instances dependent on their position with regard to the larger high and low pressure systems, the classification should primarily be based on the movements of those larger systems, and their position with regard to each other. Then, again, in looking at the depressions themselves, any intelligent and regular observer cannot fail to see that there are several distinct types in depressions themselves. So far as North-western Europe is concerned there may be named—(1) the ordinary type of cyclone, which comes to our western and northern coasts from the south-westward, just as that did which reached our shores on the night of January 24, and, passing in a north-north-easterly direction, disappeared from our area during the succeeding night, while its attendant subsidiaries crossed over Ireland and England, causing the bad weather to spread more completely over us than it would otherwise have done. (2) On some occasions, there appear, in addition to the ordinary shallow subsidiaries, disturbances of a deeper kind, which frequently travel very rapidly, and, while moving in the same direction as that followed by subsidiaries, grow deeper as they advance, causing a very decided independent circulation of wind, and occasionally maintain their existence when what appear to be their primaries have dispersed. The storm which passed over Ireland and England on the night of January 25 seems to have been of this description and is a second type, of which undoubtedly there are many varieties. (3) Then, again, we have occasionally depressions which are happily more rare than either of those mentioned—*e g.*, that which came over England with such extreme suddenness on the 24th of October last. The movements of this class seem to be entirely independent of those of any other disturbance which may be present in our neighbourhood when they appear; they have an intensity and a rapidity of motion altogether exceptional; their effects are comparatively local, and their term of existence is often brief. These, again, form quite a distinct type of themselves. Then (4) there are storms like the "Eurydice" squall—a cylinder, or perhaps a cone, of air revolving with great rapidity, with its axis horizontal, and travelling over many miles of the earth's surface. (5) Lastly, there are certain shallow disturbances—slight when considered in relation to the variations of barometric pressure which prevail in their neighbourhood, and yet powerful as rain-producers, and to these the term "thunderstorm depressions" has been applied generally.

HOW TO TRY A TELESCOPE AND HOW TO USE IT.

By L. Niesten.

(In *Ciel et Terre.*)

All our schools will ere long be provided with telescopes, which, though of small dimensions, will enable teachers to familiarize themselves with the study of practical astronomy and permit them to show their pupils the principal curiosities that the heavens exhibit to us every night. We believe it will prove useful, then, to give in this place a little information as to the method of testing a telescope and of judging of its optical qualities, and to point out how it should be used and the precautions that should be taken to secure proper conditions for observations. Those of our readers who are desirous of acquiring an instrument capable of initiating them into the wonders of the heavens will also be benefited thereby, and the advice that we shall give them will enable them to make a judicious selection from among the telescopes which, in our day, different opticians are exposing for sale at relatively moderate prices.

An astronomical telescope consists essentially of two lenticular glasses placed at the extremities of a tube which serves to hold them at a proper distance from each other. One of these glasses is very wide, and is turned toward the object. This is called the *objective;* it reproduces the image of the object behind it at a point called the *focus.* The other glass, the *ocular*, has a much curved surface, and consequently a short focus, and magnifies the image given by the objective.

The aperture of the objective alone decides the quantity of light that will be admitted into the telescope and the clearness with which objects will be seen therein. This is the principal advantage of a large telescope over a small one.

As the glass of the objective is capable of admitting a greater quantity of light, the latter may be dispersed without too greatly reducing it, by means of an eyepiece that magnifies highly. It would prove very advantageous, then, to increase the aperture to give more light to the objects; but the spherical form of our glasses does not unite the rays exactly at a single point, since the aberration due to sphericity is so much the greater in proportion as the aperture is wider. Objects become confused and badly defined when the aperture is increased sufficiently to render such aberration perceptible,

In the selection of an objective too much attention should not be paid to small bubbles and to the flaws that are found in the glass as a result of casting. What is especially important is that the surfaces of the lens be well finished.

To test an objective, care must be taken to choose a fine evening in which the air is calm: and the telescope, provided with its highest magnifying power, must be directed toward a star of medium magnitude. If the object glass is a good one the image will come rapidly into the focus, that is to say, outside of such point it will lose its sharpness on moving the eyepiece tube slightly backward and forward. The image of the star should exhibit, in a dark field, a small disk—a point almost perfectly round, without rays, aureoles, or false image. Put out of focus, the image will give a series of very concentric luminous rings whose centre will always be indicated by a brilliant point.

The images of objects of certain dimensions, such as the moon and planets, will be liable to be bordered or fringed with colours unless the achromatism of the objective be perfect. But, as it is very difficult in the manufacture of objectives to totally avoid the defect in achromatism, those lenses should be selected by preference that give, under such circumstances, images bordered with blue, while those should be rejected that give borders of yellow or red. Care should be taken, however, in these trials to employ different eyepieces, since the defect in achromatism may be due to the lenses composing these latter.

After this, it should be ascertained how the objective defines objects that are very close to each other, by examining in what manner the separation of double stars is effected. Knowing that the smaller the distance that separates the two components of a double star the greater will have to be the diameter of an objective in order to resolve them, we shall be able to effect the separation of certain of such stars by means of a given objective. Thus, it may be said that with an objective of 50 millimeters and a magnification of from 60 to 100, the companion of the Polar Star may be seen, and the following be easily separated:

α of Pisces,, μ of Draco,
γ of Leo, η of Cassiopeia.

With a telescope of 100 millimeters aperture and magnifications of from 80 to 120 and beyond, the following ought to be separated:

β of Orion, σ of Cassiopeia,
α of Lyra, γ of Cetus,
δ of Gemini, ε of Draco,
ξ of Canis Major, ι of Leo.

Sometimes the definition of an objective may be remedied by diaphragming it, that is to say, by reducing its aperture. This is done by placing over the objective a cardboard cap whose bottom contains a circular aperture that may be successively diminished by introducing against the bottom pieces of cardboard containing apertures smaller and smaller until a very sharp image is obtained. The defects in an objective may sometimes be corrected also by covering its central part with a paper disk. By thus limiting the aperture of the telescope we shall succeed in increasing the sharpness of the image, but as we have remarked above, we shall also diminish its light; so for objects that are not very luminous, such as comets and nebulæ, the entire objective should always be employed.

The eyepieces that can be used with a given objective are limited. In general it may be said that the strongest magnification that a telescope can bear is equal to the diameter of the objective expressed in millimeters, multiplied by 2. Thus, with a telescope of 75 mm. there may be used magnifications that may reach 150.

The astronomical telescope should be provided with at least three eyepieces, one of which will be of low power and wide field for stellar groups, nebulæ, and comets, and serve also to bring an object into the centre of the field when it is desired to use a higher power. The medium eyepiece will serve to examine the sun, moon, and planets, and the highest power will be reserved for the stars. It is quite difficult to use the one last mentioned, inasmuch as the focusing of it being delicate, and its field being limited, much attention is requisite to keep the object in the telescope.

If the magnifying power of the eyepiece is not known, it may be determined approximately by looking directly with one eye at a divided scale (a brick wall will do for low powers) while it is fixed directly with the other eye, by counting the number of divisions of the scale, seen by the naked eye, that are comprised in one division of the magnified image.

The *field* of the telescope is the extent of the heavens that is seen in the instrument. The field is so much the smaller in proportion as the eyepiece is more powerful. It is very advantageous to know the diameter of the field that corresponds to each of the eyepieces with which the telescope is provided, and this may be ascertained by counting the number of seconds that a celestial object near the equator (γ of Virgo, or δ of Orion, for example) takes to cross the diameter of the field. Such an observation having been repeated several times, the mean of the time obtained is multiplied by 15, and this gives the diameter of the field in seconds of an arc.

The objective and eyepieces having been selected, the mounting of the telescope should next be examined to see that it presents those features of stability and rigidity that are requisite to secure for the image the immobility which is absolutely necessary for a good observation.

The tube of the telescope is usually of copper, and its inner surface is blackened so as to avoid reflections of light. To secure an exact focusing, it is well to effect the operation by means of a rack and screw, which will move the eyepiece smoothly to the proper distance.

Afterward, the telescope must be mounted upon a solid stand whose stability should prevent any oscillation in the instrument; for oscillation transmitted to the telescope would become amplified by the magnification employed, and make the images *dance* in the field. The telescope should be capable of being moved by the band, and be so balanced that when directed toward an object it shall keep its position without being held by the observer.

It will prove advantageous in following celestial objects, to adopt an equatorial mounting to the telescope. This consists essentially of what is called a *horary axis*, which is inclined toward the horizon of the place, and which may be given a rotary motion, and of a second axis (*axis of declination*) fixed perpendicular to the first and carrying the telescope at one of its extremities. The telescope should, besides, be capable of revolving about this axis.

This arrangement, which we cannot too highly recommend, will permit the telescope, for a simple rotary motion of the horary axis, to follow any celestial body whatever during its diurnal course. But it will be necessary, before everything else, to take care that the horary axis is well located in the meridian, and that it is inclined to the horizon by an angle equal to the latitude of the place where the observation is made.

Let us now see what precautions should be taken in order to profit by all the advantages that a telescope can yield, and which, if neglected, may cause the observer to attribute to the objective an imperfection that it does not possess.

1. The observation should be made, if possible, in the open air. If it takes place in a room, care should be taken to open the window beforehand so as to bring about an equilibrium between the internal and external temperature, and, consequently, so that there shall be no currents of air to affect, through their agitation, the immobility, and hence the sharpness of the images.

2. The objective should be cleaned only in case of absolute necessity; and then, after care has been taken to remove the dust from it with a badger's hair pencil, it should be rubbed gently with a chamois skin or with a soft and clean piece of linen.

3. The removal of the objective from the telescope should be avoided, because its adjustment is a delicate operation.

4. No time should be spared in bringing the image to a proper focus.

5. When an observation of the sun is made, care should be taken to place a piece of blackened or coloured glass before the objective, so as to avoid grave accidents to the eyes.

6. Too high powers should not be employed, because there exists between the brilliancy and size of the image a proportion that cannot be modified. Beyond certain magnifications the image becomes weak and is effaced. The proper magnifications vary with the brilliancy of the object and the tranquillity of the atmosphere. For comets and nebulæ and for objects that are not very

luminous the lowest powers must be used: but for the moon and the planets the magnification must be sufficiently great to diminish their brilliancy, and sufficiently small to preserve their clearness and definition properly. High power should be used only for the stars for separating them, &c.

7. The eye must be prepared for observations. Thus, in order to see very weak objects, the observer should remain in darkness for several minutes so as to allow the retina to preserve all its sensitiveness at the moment of the observation. Before observing double stars that are very close together, the eye should become accustomed to discern like objects, and the observer should therefore begin by looking at double stars that are somewhat distant from one another. In order to observe very feeble objects, such as the satellities of Saturn, it is sometimes advantageous to direct the sight to some distance from that point in the field in which the satellite ought to be found, or, to put it in the ingenious words of Arago, to perceive an object that is not very luminous it is not necessary to look at it. On a misty evening, brilliant objects are better defined. Twilight and moonlight are often advantageous as irradiation is thus lessened.

8. Observations near the horizon should be avoided as much as possible.

9. Finally, in making observations, the memory should not be relied on, and no neglect should occur to take notes of all that is seen.

POISONOUS LEAVES.

Some of our most admired flowers, which we should least willingly banish from cultivation, are associated with green leaves of a very poisonous character. The narrow, long leaves of the daffodil act as an irritant poison; the delicate compound leaves of laburnum have a narcotic and acrid juice which causes purging, vomiting, and has not unfrequently led to death. The narrow leaves of the meadow saffron, or autumn crocus, gave rise to the utmost irritation of the throat, thirst, dilated pupils, with vomiting and purging. The dangerous character of aconite, or monkshood leaves, is doubtless well known, but each generation of children requires instruction to avoid above all things those large, palm-shaped leaves, dark green on the upper surface. Leaves of coarse weeds provide an abundant quota of danger, but frequently their strong scent and bitter or nauseous taste give timely warning against their being consumed. Of all our British orders of plants perhaps the umbelliferous order contributes the rankest and most widespread elements of danger. The tall hemlock is everywhere known to be poisonous, and it is one of the most abundant occupants of the hedge. A peculiar "mousy" odour can generally be recognised on squeezing the leaves, which are deep green in colour and trebly compound, the small lobes being lanceolate and deeply cut. It is said that the mousy smell can be detected in water containing not more than a fifty-thousandth part of the juice. Hemlock is both an irritant to any sore place and a general narcotic poison, producing headache, imperfect vision, loss of power to swallow, and extreme drowsiness, with complete paralysis of voluntary muscles and muscles of respiration. The water drop wort, too, a flourishing ditch plant; the water hemlock, fool's parsley, must be ranked among our most dangerous poisonous plants belonging to umbelliferous order. The fool's parsley leaves are sometimes mistaken for genuine parsley, but their nauseous odour and darker leaves should prevent this. The nightshade order is another, with dangerous and often extremely poisonous leaves. Indeed, no nightshade can be regarded as safe; while the deadly nightshade, with its oval, uncut leaves, soft, smooth, and stalked, is in the highest degree to be avoided. Henbane and thorn-apple, again, with their large and much-indented leaves, are conspicuous members of the "dangerous classes." Holly leaves contain a juice which is very narcotic and acrid, causing vomiting, pain, and purging. Even elder leaves and privet leaves may produce active and injurious irritation when eaten. With regard to treatment in cases of poisoning by leaves, if no doctor is at hand, produce vomiting till all offending matter is expelled, and, when considerable sleepiness or drowsiness has come on, give strong tea or coffee, and again bring on vomiting; then stimulate and rouse the brain in every possible mode.—*Land and Water.*

ANIMAL INTELLIGENCE.

Mr. C. Lloyd Morgan, in a lecture delivered in Cape Town, South Africa, has the following:—

From the time of Locke downward the question, How far have animals the power of abstraction? has often been discussed. Locke himself maintained that "the having of general ideas is that which puts a perfect distinction between man and brutes, and is an excellency which the faculties of brutes do by no means attain to." And this view is warmly advocated by Prof. Max Muller and other living thinkers. On the other hand, Mr. Romanes, who has made the subject of animal intelligence a special study, writes: "Give a cat or a dog some kind of meat or cake which the animal has never met with, and the careful examination which the morsel undergoes before it is consigned to the mouth proves that the animal has properly abstract ideas of sweet, bitter, hot, nauseous, or in general, good for eating, and bad for eating, *i.e.*, abstract ideas of quality as apart from the object examined—the motive of the examination clearly being to ascertain which general idea of quality is appropriate to the particular object examined."

Our first duty in a case like this is to make quite sure of the meaning of the words we employ. Much confusion may be, and has been, introduced into this subject by a lax use of words. Let us consider, then, the several meanings which these terms abstraction and abstract idea may have.

In the first place it seems to me that our most ordinary impressions involve abstraction. An object is capable of affecting us in a number of different ways, but of all these at any given moment we only pay attention to one or two which happen to interest us. The rest are practically nonexistent for us. The mind automatically rejects or eliminates them. This is certainly a process of abstraction, but for the sake of clearness I venture to call it *elimination.* By meads of elimination we get definite, clear-cut mental impressions.

In the second place our general conceptions involve abstraction. A general conception is one which does not stand for a particular object, but for a group of objects. It is arrived at by abstracting the essentials and neglecting the unessentials. In the great number of dogs I see around me, there are certain essential characters in the midst of some diversities. As I consider them in the mass, however, the diversities cancel each other in my mind, and I obtain a general conception of a dog. We may for the purpose in hand call this process *generalisation.* The product is *not* a definite and clear-cut image.

In the third place, I may by a process of abstraction consider a quality apart from the things that possess that quality—whiteness for example, apart from white objects, edibility apart from edible things. We will here retain the term abstract idea to denote such qualities, and we will for the present term the process by which they are obtained *isolation.* Of a completely isolated quality no mental image can be formed.

That dogs and the lower animals in general make use of the process I have above termed elimination, cannot, I think, for one moment be doubted. For if they do not, then we must suppose that they are able mentally to grasp an object in the entirety of its qualities, which is more than the average human being can do. Let us suppose that a dog sees what he believes to be a soaked dog-biscuit. The impression he receives through his eyes at once suggests certain possible olfactory impressions and certain possible gustatory impressions. This of course implies what is commonly called the association of ideas. But there are other possible impressions which might be suggested, but probably are not, such impressions, for instance, as may be produced by the hardness, temperature, and weight of the object. These impressions are not suggested, they are eliminated, so to speak. In other words, certain possible impressions are abstracted from certain other possible impressions. Suppose, now, the dog proceeds to smell the biscuit that he has hitherto only seen. If it answers to his expectations he at once begins to eat it. His nose tells him that it is good for eating. If, however, it does not answer to his expectations, if, perhaps, it has received the drippings of a paraffin tin, he turns sorrowfully away. His nose tells him that it is not good for eating. One kind of smell suggests that the biscuit will be pleasant to the taste; another kind of smell suggests that it will be unpleasant. And the dog, unless he be a very young one, having confidence in his nose, acts upon the suggestions without verification. It is to these suggested impressions that Mr. Romanes applies the term "abstract ideas of quality, as apart from the object examined." And I do not suppose that any one is prepared to deny our dumb companions abstract ideas *in this sense of the term.*

Let us now consider how far we may suppose animals to possess the power of generalisation in the sense in which I have above used this term. A dog lying asleep upon the hearth-rug hears outside the window an unusual footstep. He at once pricks up his ears and gives a half-suppressed growl. Must we not suppose than in such a case as this the footstep suggests to the dog the idea of a strange man? And if so, will not the suggestion—of whatever character it might be—be general rather than particular? If it be a mental picture—and we are often told that dogs think only in pictures—must not the picture be generic in its character, like Mr. Galton's composite photographs of the average blackguard? And if it be a symbol of some kind, must it not be a symbol that stands for strange man in general, since there is nothing to suggest any particular strange man? But if this be so, and if a general conception is one which stands not for a particular object, but for a group of objects, I do not see how we can deny general conceptions, in this sense of the word, to our four-footed friends. And if the word abstract idea stand, as it is sometimes made to do, for general conception, we must admit, I think, that such abstract ideas are possible for the brute.

We come now to such abstract ideas as result from the process I termed isolation. Are these, too, possible for the brute? I have only to say that it has always seemed to me that when we speak of being able to form abstract ideas of redness, emptiness, justice, and the like, all we can possibly mean is that we can make use of the *words* as symbols in a train of thought. I have only to say this to indicate the nature of my answer to this question, I believe such abstract ideas to be impossible for the brute. I believe them to be the outcome of the use of language. We see a plum, and we find that it is round, and blue, and resisting.

From these words we form abstract nouns, roundness, blueness, resistance. We then proceed to manufacture a something to which each of these words may answer, and we call that something a quality. Having thus made the quality, the next thing we do is to try and endow it with a separate existence, and to the results of our endeavours we give the name abstract idea.

All this is a process which grows out of our use of words under the influence of a developed power of reflection; it is an attempt to conceive a reality-in-thought answering to certain of our symbols. Without a considerably developed use of symbols such a process is impossible. Hence I believe that no animal can form an abstract idea in this sense of the term. He does not possess the only possible means of doing so. To form such abstract ideas as these is certainly "an excellency which the faculties of brutes do by no means attain to." Here we may agree with Locke and his followers.

May we say, then, that the power of forming abstract ideas, in this sense, is that which distinguishes the intelligence of man from the intelligence of the brute? I think not. There are, I believe, among the lower races of man, whole tribes which are unable to form abstract ideas. Abstract ideas are made possible by language, but the use of language does not necessarily imply the ability to form abstract ideas. Philologists tell us that there are languages or dialects in which no abstract words are to be found. This, however, is certain, that there is no known savage tribe which has no language. Man is the one being that can make use of spoken signs.

But it may be said that, although their language differs from ours, animals too have their language, imperfect, it is true, but still a language of their own, a means of communication with their fellows. And this is perfectly true. It is true, too, that my dogs can understand *my* language. But all that a dog can communicate to his fellow—all that I can communicate to my dog is a sign which he has learnt to associate with certain feelings or with certain actions to be performed. The communication deals, too, with immediate feeling or action; its sphere is the here and the now. There can be no doubt that dogs associate with barking in certain tones, special emotional states in their companions. In fact, it is probable that dogs can in this way communicate with each other a wide range of states of feeling. But these states are present states, not states past or future. They are their own states, not the states of others. A dog can call his companions' attention to a worriable cat, or he may have his attention roused by my exclaiming "cat." But no dog could tell his companion of the successful "worry" he had just enjoyed, or suggest that they should go out for a "worry" to-morrow morning. And here we come upon what seems to me the fact which raises man so immeasurably above the level of the brute. *The brute has to be contented with the experience he inherits or individually acquires. Man, through language spoken or written, profits by the experience of his fellows.* Even the most savage tribe has traditions extending back to the father's father (Sproat). And the civilised man—has he not in his libraries the recorded results of many centuries of ever-widening experience and ever deepening thought? Thus it is that language has made us men. By means of language and language alone has human language become possible. This it is which has placed so enormous a gap between the mind of man and the mind of the dog. Through language each human being becomes the inheritor of the accumulated thought and experience of the whole human race. Through language has the higher abstract thought become possible.

But though I look upon the difference between human intelligence and brute intelligence as very great, *I do not believe that there is any one faculty which all men possess and which no brute possesses.* I have already stated my views on the subject of abstraction, and to what I have said I have nothing now to add. But concerning the converse process of *construction* or object forming a few words may be said. Let me first explain what I mean by construction. Our conception of an object is the result of a synthesis of its qualities. But this synthesis is, I imagine, of two kinds. There is a synthesis by immediate association, and a synthesis by reflection. When a dog sees before him a soaked dog-biscuit his conception of the object is a synthesis by immediate association. The sight of the biscuit at once suggests by association a certain smell and taste. The object he mentally constructs is built up of these three—sight, smell, and taste. All other properties are rejected or eliminated. Now, suppose the dog capable of reflecting thus—the biscuit is light enough to carry, soft enough to bite, cool enough not to burn my mouth—he would then add to his synthesis by immediate association a further synthesis by reflection, and would construct a more complete object. By the synthesis by reflection, in fact, all those qualities are added which are unconsciously eliminated in the immediate construction by association. I do not imagine that brutes have sufficient power of reflection to affect to any great extent this further synthesis. Indeed, I imagine that savages and young children do not habitually go further than the construction by association. The further process has been added mainly under the influence of a developed language. The *word* groups around itself not only the cluster of associated ideas which make up the ordinary unreflecting conception of the object it symbolises, but also those further ideas which are the result of scientific study. The word is the peg upon which we hang those abstract qualities which by means of words we have isolated.

RICHARD TREVITHICK, AND HIS INVENTIONS.

OUR contemporary, the *Mining Journal*, has inserted the following, in which the *Scientific Review*—having repeatedly asserted the shameful inadequacy of public recognition of Trevithick, whose part in the origination of the locomotive should never have been smothered over—heartily concurs.

The announcement a few months since in the *Mining Journal* that it was proposed to raise a memorial to Richard Trevithick, and that April 22, 1883, being 50 years from the date of his death, and 80 years from the successful application of the locomotive, had been suggested as a suitable day for action, gave rise to renewed activity on the part of his admirers with a view to remove the long-standing reproach that whilst men who have done much less for progress and the advancement of industry have been favoured with statues and social distinctions, Trevithick has been utterly neglected. It is gratifying, however, to find that Mr. Hyde-Clarke's proposition met with an immediate and hearty response not only in Cornwall—Trevithick's native county—but throughout the country, and that as Mr. Hyde-Clarke was virtually Trevithick's first biographer, so he will have the honour and pleasure of being the originator of the first successful movement to secure him a memorial worthy of his great genius. The co-operation of Major John Davies, who, as already stated, has accepted the duties of the honorary secretaryship, was quickly followed by that of Mr. William Husband, the President of the Mining Institute of Cornwall, and one of the well-known firm of Messrs. Harvey and Co., of Hayle, and their exertions have been attended with excellent results. That Trevithick has not long ere this been recognised by a suitable memorial is probably due to the rapid progress of invention during the present century having caused his name to be forgotten by many amidst the confusion of the multitude of inventors, rather than to any intentional slight of talent; and the neglect to recognise him as one of the greatest of the inventors connected with the perfecting of the steam-engine may also be in a measure attributable to the many directions in which his inventive genius found vent. Not only did he play an important part in the introduction of locomotive and high-pressure-steam, but he was the inventor of warming apparatus, iron stowage tanks, iron buoys, a gun carriage for single-decked ships, hydraulic engines, an improved furnace for purifying silver ores, a salt water distilling apparatus, and floating docks. For the present, however, it will suffice to refer to his steam-engine inventions.

Although Trevithick was by no means an unsuccessful man, it must be admitted that he was unfortunate to an extent which more than neutralised his advantages. He achieved many successes in England, and in Peru his merits could scarcely have been more generously recognised, yet political troubles deprived him of all the benefit which would otherwise have accrued to him, and there appears no doubt that when he reached Falmouth in 1827, on his return from the New World, he was absolutely penniless, and that he had not recovered his lost ground at the time of his death six years after. In the history of invention there is usually great difficulty in fixing the originator of any great improvement owing to the circumstance that most contrivances which subsequently prove to be great inventions are in the first instance introduced in so crude a form that they are impracticable, yet the modification required is often so trifling that whilst reflecting the highest honour upon him who makes it should scarcely be regarded as lesssening the merit of the introducer of the crude arrangement. Trevithick's successful use of high-pressure steam and of the steam-blast in connection with the locomotive appears indisputable, although both may have been described by previous inventors, and both have been claimed as new applications by engineers long after he had employed them. In 1796 Trevithick constructed working models of high-pressure engines, and by 1800 these were developed into an engine of working size, for in that year a high-pressure portable steam-engine was carried on a cart to Wheal Hope, and put to work there; his high-pressure steam-whims appear to have been got to work in the same year. As to Trevithick introducing the steam-blast as an intentional arrangement, and not by mere accident as some have pretended, there can be no question, for in describing the working of the engine Trevithick himself says: "The steam that is discharged from the engine is turned up the chimney, about 3 ft. above the fire. The fire burns much better when the steam goes up the chimney than when the engine is idle."

In the Penydarran engine which was in operation in South Wales before 1804, Trevithick used the steam-blast and had an arrangement for regulating it; he had likewise a chimney damper, and utilised the waste steam to heat the feed water. Many interesting details concerning this Penydarran engine were given in the *Mining Journal* in 1858, not the least important of these being the statement of Rees Jones, engine-fitter of Penydarran, then 82 years old. This statement was attested by the late William Menelaus, G. Martin, and W. Jenkins, and Mr. Menelaus called particular attention to the fact proved by it that the wheels were smooth, and that no rack-work was used on the road, so that in 1803 Trevithick had satisfied himself that smooth wheels on a smooth road would have sufficient adhesion to propel a load, and had hit upon a plan for coupling the wheels. That we should never have had high-pressure locomotives but for the genius of Trevithick it would be difficult to prove, more especially as experience teaches us that there are usually several inventors working in the same field about the same time, and often quite independently of each other, but it must be acknowledged that his inventions were at once original and important, and really formed the basis of that almost perfect locomotive system which the world at present enjoys, so that as credit and recognition has long since been given to men who, although ingenious, devoted themselves solely to the perfecting of arrangements which Trevithick invented, it is surely not too much to ask for hearty support, moral and pecuniary, to ensure at last a proper recognition of the genius Trevithick himself. The date of the proposed ceremonial is now but two months distant, and hence it is essential that all should work quickly as well as energetically in order to ensure the maximum result.

MILD STEEL FOR THE FIRE-BOXES OF LOCOMOTIVE ENGINES IN THE UNITED STATES OF AMERICA.

By John Fernie, M. Inst. C.E.

At the Ordinary Meeting of the Institution of Civil Engineers, on the 30th of January, Mr. Brunlees, President, in the chair, a Paper was read on this subject.

It was stated in the paper that the use of mild steel for the fire-boxes of locomotive engines was now general in the United States. Although large numbers of the outer shells of the boilers were still made of iron plates, this was simply to effect a saving of expense, and many railroad companies had the boilers wholly of steel. Iron plates were first used as a substitute for copper, owing to the rapidity with which the anthracite coal wore away the soft copper. When sound the iron plates gave better results, but the weldings were frequently unsound; they were apt to blister, and the plates were subject to crack near the fire-bars. Steel fire-boxes, the plates being a nearly pure compound of iron and carbon, were used for the Pennsylvania Railroad engines eleven years ago. Since then, excellent steel for this purpose had been made by the Siemens-Martin open-hearth process in many places in the United States. The mode of manufacture of this steel was briefly described, as it differed from English practice. The specification for boiler and firebox steel last given out by the Pennsylvania Railroad Company was quoted. The author next proceeded to state that in the cities of the United States, all steam-boilers for stationary engines were placed under municipal regulations whereby a proper registration and inspection were instituted at a small cost to the user. In Philadelphia about 4,000 boilers were tested once a year, and a licence was given by the Inspector to use the boiler for one year, at the pressure it was considered fit to sustain. The formulas, under which the calculations were made, were stated, and the tests employed. The highest test was when a boiler-plate, from which a portion was cut off lengthwise, showed a ductility of 20 per cent. upon a measured length of twelve thicknesses of the plate, and when cold would bend to 180° over a diameter equal to five thicknesses of the plate, or when cut crosswise would bend cold to 90° over a diameter equal to five thicknesses of the plate. In every steam-vessel navigating the lakes, rivers, and seas of the United States, and sailing under its flag, a complete system of inspection during manufacture, and an examination of boilers when made, was maintained by the Government, and all boiler-plates had to be branded with the maker's name, and with the tensile strength of the plate per square inch. Makers of boiler-plates were pecuniarily liable for any failure of the material if it occurred at a lower strain than that with which it was branded. Officers for examining and testing the materials and work done were appointed, and the question seemed to be much better understood and practised in the United States than in England. With respect to locomotive engines, which were in one city one day, and in another on the next, and which might constantly be moved out of one State into another, there could be no Municipal or Government control, but there was a healthy public opinion on the subject and heavy damages would be obtained against any company whose boilers exploded from neglect, or from the use of bad material. In America, it was stated, railroad engineers were not hampered by Government control. There was no necessity to urge railway companies to adopt improvements. Inventions were quickly examined, tested, and rejected or adopted. Hence the march of improvement was more rapid than in Great Britain. The author then proceeded to describe, first, the English type of locomotive firebox, and afterwards the various new forms of American fireboxes. In the former the strains set up by the greater expansion of the inner box over the outer, from the higher temperature, were aggravated from the material being of copper, which expanded more than iron under equal increments of temperature. Greater stress was thrown upon the stays, and by the use of copper and brass tubes a galvanic action was established in locomotive-boilers, which speedily destroyed the iron plates. The author illustrated the American type by two examples of boilers and fireboxes in use on the Pennsylvania Railroad, and he pointed out in how far they approached the conditions of what he held to be a perfect firebox of the old and well-known form. The requirements for a firebox of this kind were, that the plates forming the outer and inner boxes should be of similar metal, that as the metal of the inner box must always expand more than the outer, it should be thin enough to bend or spring between the spaces where it was held by the round stays, that to compensate for the extra expansion, the heavy roof-beam stays should be done away with, that there should be a number of water-tubes through the body of the fire-box, that the fire-bars should also be water-tubes, that the areas of the firebox and grate should be large, and that the materials of construction should be cheap and easily obtainable. The author demonstrated that in these respects the American was far in advance of the English type of locomotive-boiler, With regard to cost he showed that as steel fireboxes were only half the weight of copper ones, and as the price per ton of the former metal was about one-third of the latter, the actual cost of steel fire-boxes was from one-fifth to one-sixth the price of copper ones, although the cost of workmanship would be a little more in working steel.

HUDDERSFIELD FINE ART AND INDUSTRIAL EXHIBITION.

During the coming summer a Fine Art and Industrial Exhibition will be held at Huddersfield in connexion with the opening of the New Technical School. Perhaps a brief sketch of the progress of technical education in Huddersfield may be interesting to our readers.

In the year 1840 the Mechanics' Institute was founded, and the committee almost immediately directed their attention to the formation of classes for instruction in designing, chemistry, and a little later dyeing, weaving, and mechanical engineering. In addition to these there were science, art, and elementary classes. Steady development and growing success were the results of careful and judicious management, so that it was found necessary in 1843, 1849, and 1861, to make successive removals to larger and more commodious buildings.

About four years ago the Huddersfield Chamber of Commerce considered the advisability of establishing a technical school exclusively, but seeing that the work had been carried on successfully by the Mechanics' Institute Committee, in conjunction with other departments of study, it was resolved to form a joint committee from the two bodies to take in hand the erection and furnishing of a much larger building adapted to all the requirements of the present work of the Institute, and especially providing for the development of the Technical Department. This has now been done, and the formal opening will take place on June next, when it is expected that a member of the Royal Family will honour the borough by a visit. For the purposes of the Fine Art and Industrial Exhibition which will inaugurate the opening, a large and influential committee has been appointed, with Colonel Brooke as President, and Sir Charles W. Sikes, Kt., as Treasurer, and sanguine hopes of a great success are entertained A fund of £2,000 for guaranteeing the expense was asked for, but so readily subscribed to by the leading local firms and gentlemen, that it now stands at £6500. Prospectuses of the Exhibition and forms for application for space have been extensively supplied to intending exhibitors, and there seems every prospect of such an exhibition as will command extensive popularity.

FOREST AND CLIMATE.

A paper has been prepared by Dr. Schomburgk, the Director of the Botanical Gardens at Adelaide. on the influence of forests on climate. The object of the author is to prove that the destruction of forests usually has the effect of reducing the rainfall, while, on the contrary. the planting of trees broadcast over a country is one of the best methods which can be adopted for ameliorating its climate and increasing the annual fall of rain. It cannot, indeed, be proved that the climate of South Australia is altering for the worse in this respect. In fact, a comparison of the meteorological records will show that the annual average rainfall for the colony during the past ten years has been 21·1 inches, as compared with 20·1 inches for the previous ten years. The fact is, that in the agricultural districts of the colony, and espscially in those which were not originally timbered, the bringing of the land into cultivation has had the effect of slightly favouring the fall of rain. Ploughed land attracts moisture to a much greater degree than the unbroken soil. In considering the effect which the removal of forests *per se* has in altering the climate in South Australia, the only direct test that could be taken from the records issued by the Government Astronomer is the experience of the neighbourhood of Adelaide. If the time is divided which has elapsed since 1839, the year in which observations were commenced, into two periods, there is found for the first an average rainfall of 22·8 inches, and for the second one of 21·7 inches. It will thus be seen that, on the whole, the rainfall at Adelaide is diminishing, though very slightly, and perhaps the diminution in the amount of timber may have something to do with the change. Dr. Schomburgk, in searching for illustrations of the effect of trees on climate, goes further afield, and brings forward some striking instances, in which it is evident that loss of forests means loss of rain fall, and *vice versa*. He recalls how the Russians, by burning down some of the Transcausasian forests at the time of the struggle with the Circassians, converted the country from a fertile land into a desert, simply through the cutting off of the supply of rain. Similar instances of rain having deserted a country denuded of forests have occurred in the Mauritius, in Jamaica, the Azores, and, it may also be added, to a still more remarkable extent in several of the smaller West India islands. No sooner had the forests of these places been destroyed than the springs and rivulets ceased to flow, the rainfall became irregular, and even the deposition of dew was almost entirely checked. On the other hand, it is generally accepted as a fact that Mehemet Ali increased the fertility of Egypt enormously by planting trees. He alone planted some 20,000,000 on the Delta: his successors followed up the work, and it is a noteworthy circumstance that the rainfall rose from 6 inches to 40 inches. Planting has also, it would seem, produced remarkable effects in France and Algiers. Extensive regions have been planted with gums and other trees, which, for the most part, grew to about 30 feet or 40 feet in height, and it is noticed that the quantities of rain and dew which now fall on the adjacent land are double what they formerly were.

RECENT TELEPHONE EXPERIMENTS IN PARIS.

There was a very interesting experiment performed quite recently between the Hippodrome and the officers of the International Telephone Co., 15 Place Vendome (Paris). The orchastra of the Hippodrome, which plays during the day and evening for the two daily performances, was heard distinctly by numerous invited guests assembled at Place Vendome. There were ninety-six telephone receivers, and each auditor having two of them, forty-eight persons were enabled to hear at the same time. Owing to the fact that one of the two wires that usually serve for the direction of the hippodrome was in use, only one wire was disposable for the experiment. The apparatus was arranged at the Hippodrome as follows: There were twenty-five microphone transmitters mounted on a single board, which was inclined slightly from the horizontal over the leader of the orchestra. The microphones were, it should be understood, above the board and protected from dust by a light box. The board itself was supported by four cords. The pile consisted at the beginning of three Reynier-Faure accumulators. The intensity of the current was indicated by a Deprez galvanometer placed in the circuit, and was kept sensibly constant by adding to these three accumulators another, then another, until the total number was nine. The current of the pile was branched between the twenty-five microphones, then into the twenty-four primary wires of twenty-four induction coils that were mounted by twos in series of twelve on a derived circuit. The intensity of the current was twelve amperes. The twenty-four secondary circuits of the twenty-four induction coils were grouped by fours in series, and six on a derived circuit. The resistance of each was 300 ohms, or altogether 1.200 ohms. The line from the Hippodrome, 3.512 meters in length, ended in one of the offices of the General Society of Telephones, Rue Petits-Champs, where also ended the line from Place Vendome, which was a very short one. The receivers, which were of the Ader type, were grouped by sixteen in series, and six on a derived circuit.

The clearness with which the music was heard was perfect, and all the auditors were perfectly satisfied with the result.

In the arrangements noted above, which were a great improvement over those employed at the Exhibition of Electricity, the principal novelty consisted in the association of the twenty-five microphones on a derived circuit, and in the association of the twenty-four secondary wires of the induction coils for tension and quantity, as is done with pile elements.—*L'Electricien.*

RECENT AMERICAN AND FOREIGN PATENTS.

A *steam rock drill* of considerable novelty has been patented by Mr. Simon Ingersoll, of Stamford, Conn. The invention consists in a steam rock drill constructed with the way plate that carries the steam cylinder connected by bolts having L-heads and bearing blocks with a sleeve, to the ends of which the side legs are connected by universal joints, that the steam cylinder and the legs can be readily adjusted in any desired position. Within the steam chest two valves are attached to the outer ends of two levers, the inner ends of which are connected by an equal-armed lever. The valve carrying levers are so arranged that the valves will be operated at the proper times by the movements of the piston.

Churn.—Mr. Julian Lane, of Moss Run, O., has patented a churn. The object of the invention is to provide simple means for securely holding churn bodies of different diameters upon the frame; and it consists of an adjustable and hinged holder extending transversely across the base frame, and adapted to securely hold churns of any diameter or height during the operation of churning.

An improved *wet gas meter* has been patented by Mr. William Mackintosh, of Callao, Peru, S.A. The invention consists in certain novel features of construction, having the object to secure correct and unvarying measurement of the gas at all times without regard to the change in the water level, and also to furnish a meter that shall not require to be charged with water except at long intervals.

A novel *snap hook* for holding rings has been patented by Mr. Francis A. Hake, of Cuero, Tex. The invention consists in a hook provided with a sliding latch on the shank and on the end of the hook, whereby the hook will remain closed in whatever position it is placed; and also in sliding bolts and sliding sleeves on the shank and on the end of the hook, whereby double latches will be formed on the end of the hook and on the shank.

A novel device for tightening the bands of *elliptical springs* has been patented by Mr. William Wallace Bruce, of Western Port, Md. The invention consists in a box in two parts or dies, constructed to receive the spring in between them, and having the opening for such purpose arranged obliquely to the closing line or plane of motion of the dies, whereby the pressure put upon the band is equal on all sides and instantaneous, and the whole accomplished in a simple, rapid, and effective manner.

Converting motion, patented by Theophilus Sargent, of Hallowell, Me., relates to the lever contrivance for producing rotary motion by means of a couple of toothed segments on the lever working loose pinions on the shaft, which alternately gear with it by ratchets and pawls, one going forward and turning the shaft, while the other is going backward to the starting point; and the invention consists of a stopping and reversing attachment to be applied to the above.

A *safe* of novel construction for use on ship-board has been patented by Mr. David W. Smith, of Port Townsend, Washington Ter. The invention consists in a safe which is cheap as to cost compared with other burglar and fire-proof safes, simple in construction and operation, waterproof and buoyant, burglar proof while on board ship, and fire-proof. Free itself to float from a sinking ship without assistance, to keep afloat for an indefinite time until washed ashore or picked up, and to preserve its contents from loss by sinking or injury by water, and endure being thrown upon a rocky coast without breaking. The inventor claims all these advantages for his new invention.

A *fire-engine* of simple construction, light weight, and easy transportation, has been patented by Mr. Lyman H. Zeigler, of Redkey, Ind. The invention consists in a pump pivoted in a frame mounted on a U-shaped axle supported on wheels, whereby the axle can be swung upward, so that the pump and frame will be raised during transportation; or the axle can be swung downward, so that the frame rests on the ground and forms a firm bearing for the pump during operation. The frame is provided with a tongue or pole for pulling or pushing the engine, and with pivoted braces for locking the parts in position when the axle is raised.

An improved *wagon box* has been patented by Mr. Eugene F. Chapman, of Wilson, Neb. The invention relates to improvements in the end boards of wagon boxes, and to the means for attaching them to the box and holding them in place for closing the ends of the box; also to separate side and end boards for enlarging the wagon box.

A *fowl fetter*, the invention of Mr. Sanford J. Baker, of West Waterville, Me., has recently been patented. A metallic collar is fastened around the leg of a mischeivous fowl, to which are attached wire spurs of considerable length. This collar is beveled at the edge to prevent chafing of the mnaacled leg of the disobedient fowl, who is thus restrained from doing damage about the premises.

An improved *bending machine* has been patented by Mr. Lindsay B. McNutt, of Ashtabula, O., which has for its object the bending of buggy shafts, carriage poles, pole bars, &c., the apparatus being arranged to be operated by steam or compressed air or by hand. The essential feature of the invention consists of a former and attachments wherewith a pair of carriage shafts or couple of poles, pole bars, or other like pieces of carriage or wagon stock may be secured by one set of apparatus and be bent at the same time.

A novel *railroad signal* has been patented by Mr. David C. Baughman, of Albion, Ind. The invention consists of a lantern, two sides of which are furnished with bull's eyes, and the other two sides with signal wings, the whole being mounted upon a rotary carrier or table, so arranged that by means of a cog wheel it may be rotated so that the position of the signal in relation to the track may be changed. The axis turning the cog wheel passes through the tubular arm supporting the signal and carries a grooved wheel on its further end, which may be turned by means of a chain or rope connecting it with the ground or with the signal station.

Building Exhibiton.—The forthcoming Building and Machinery Exhibition at the Aricultural Hall will be the most important of any of these technical exhibitions that have as yet been held. All the space in the body of the Hall has already been allotted, and the galleries are fast being let, and this will be the first occasion on which the Hall will be completely filled. All classes of the building trades will be fully represented, and the entries comprise the leading manufacturers and exhibitors who are interested, either directly or indirectly, in the trade. The advantages of these special exhibitions are that they enable buyers and sellers to meet from all parts of the country, and afford intending purchasers the opportunity of judging of the respective merits of rival inventions when placed side by side. Applications for information or space should be made to Mr. P. Shrapnel, Secretary, Wallbrook, E.C.—*Martineau and Smith's Journal.*

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